

AG

(12) **UK Patent Application** (19) **GB** (11) **2 318 924** (13) **A**

(43) Date of A Publication 06.05.1998

(21) Application No 9722853.0

(22) Date of Filing 29.10.1997

(30) Priority Data

(31) 9622652

(32) 31.10.1996

(33) GB

(71) Applicant(s)

The Whitaker Corporation

(Incorporated in USA - Delaware)

**4550 New Linden Hill Road, Suite 450, Wilmington,
Delaware 19808, United States of America**

(72) Inventor(s)

Michael Joseph Gerard Whelan

(74) Agent and/or Address for Service

Baron & Warren

**18 South End, Kensington, LONDON, W8 5BU,
United Kingdom**

(51) INT CL⁶

H01R 13/627

(52) UK CL (Edition P)

H2E ECCC E203

(56) Documents Cited

GB 2177266 A

GB 2061633 A

(58) Field of Search

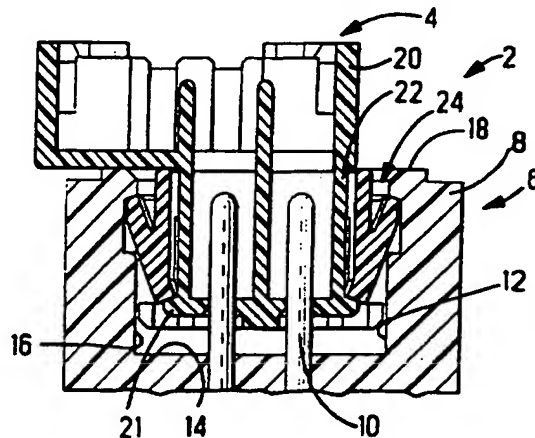
UK CL (Edition P) H2E ECCC

INT CL⁶ H01R 13/627

(54) **Connector locking device**

(57) A retention device (24) for locking connectors (4,6) together comprises a collar (26) having integral locking lances (28) projecting obliquely through windows (30) in the collar. The lances (28) are resiliently pivotally attached to the collar about a pivot axis (38). The collar is positionable within a cavity (12) of a first connector whereby outer and inner ends (32,34) of each lance engage shoulders (40,44) of the first and second connectors respectively. A self-tightening locking effect is thus achieved. Uncoupling of connectors is effected by depressing the collar such that the lance abuts a rounded corner 46 of the connector wall (16) thereby pivoting the inner end (34) out of engagement with the second connector locking shoulder (44).

Fig. 1



GB 2 318 924 A

Fig. 1

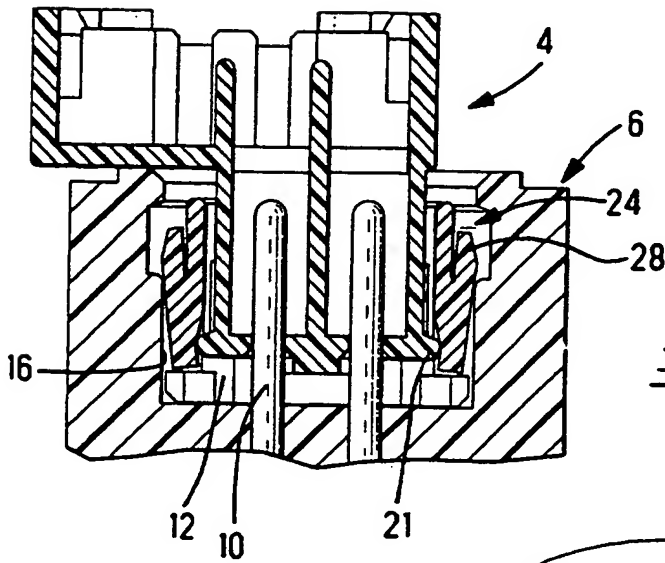
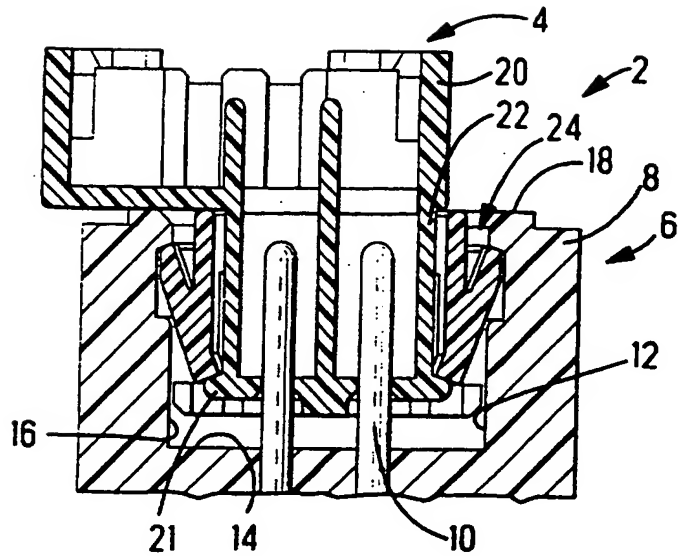
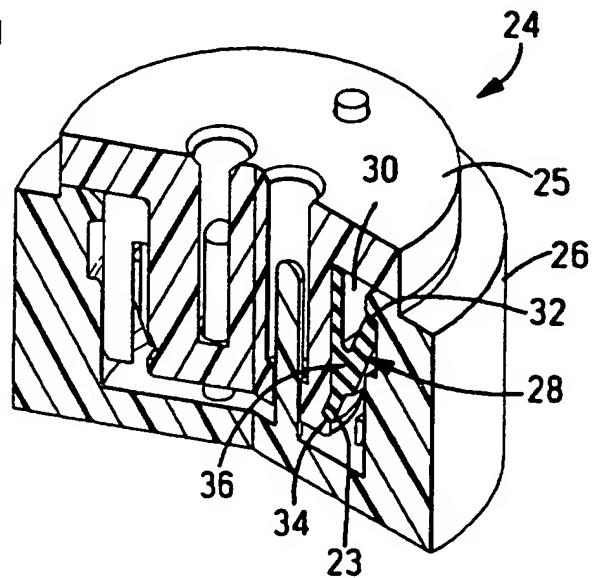
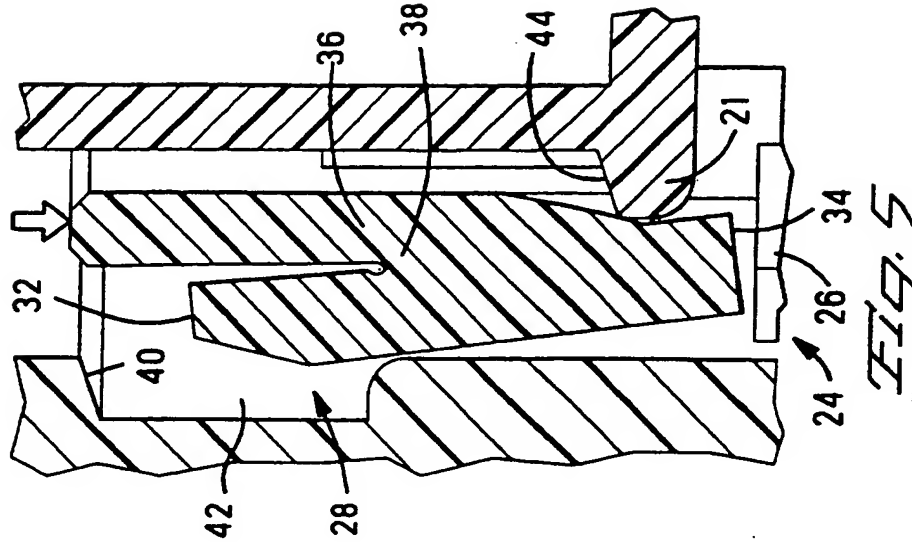
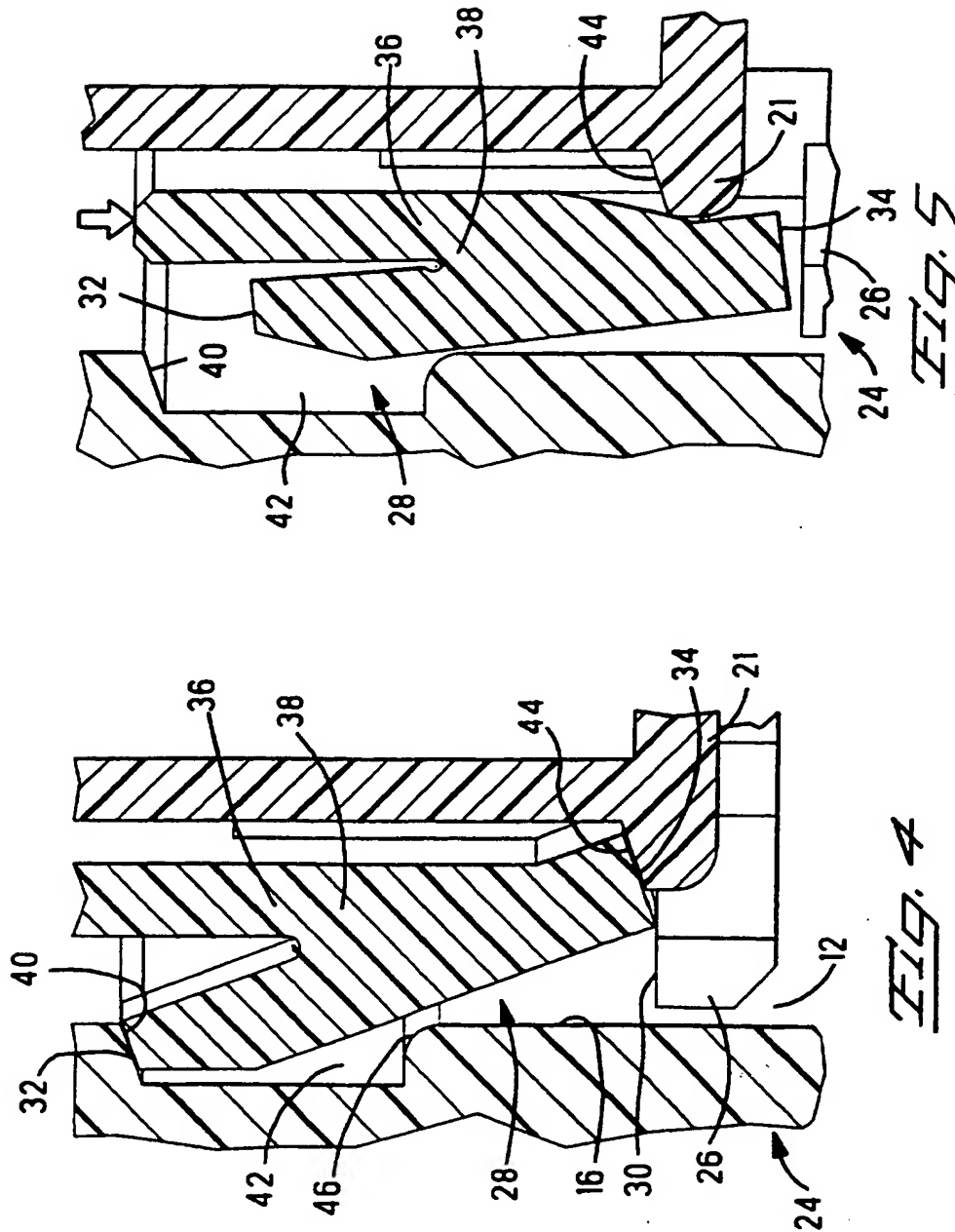


Fig. 2

Fig. 3





CONNECTOR LOCKING DEVICE

This invention relates to a device for locking mated connector assemblies.

5 In certain applications it is desirable to provide a connector assembly locking device comprising a separate collar mounted between mating connectors for locking the connectors together. For example in European patent application EP-A-713266, a locking device in the form of a
10 separate collar is provided. The locking device in this publication is stamped and formed from sheet metal and comprises resilient locking lances for securing the collar within a cavity of a first connector and further locking lances for latching engagement with a second mating
15 connector. In this application, the first connector is integral with a gas generator for automotive airbag applications. Such applications require particularly reliable and secure retention of mated connectors. It is thus desirable to provide a particularly robust and reliable
20 locking device for such applications. It would be further advantageous to provide a locking device that is compact and enables rapid and simple plugging of connectors. Whilst simple, purposive unplugging is desired it would be advantageous to provide a locking device that inhibits
25 accidental-unlocking.

An object of this invention is therefore to provide a locking device for connector assemblies that is robust, reliable and easy to use. It would be further advantageous to provide a locking device that is compact and cost effective.

30 Objects of this invention have been achieved by providing a connector locking device comprising a locking device for securely locking mated first and second connectors where the second connector has a mating portion received within a cavity of the first connector, the locking device
35 comprising a peripheral wall receivable in the first

connector cavity, the locking device comprising one or more locking lances engaging the connectors for locking them together, wherein each lance has an outer and inner end positioned on outer and inner sides of the peripheral wall for engaging locking shoulders of the first and second connectors respectively, the lance being resiliently pivotally mounted at an attachment portion to the peripheral wall.

Advantageously therefore, a robust, safe and compact connector locking device is provided. Further advantageous aspects of this invention will be apparent from the following description, claims and drawings.

An embodiment of this invention will now be described by way of example with reference to the figures, wherein;

Figure 1 is a simplified cross-sectional view of mated connectors latched together with a locking device according to this invention;

Figure 2 is a view similar to that of figure 1 with the locking device in a release position for unlocking of connectors;

Figure 3 is an isometric, partial cross-sectional view of a locking device; and

Figures 4 and 5 are partial cross-sectional views of a locking device in locked and released positions respectively.

Referring to figures 1 and 2, a connector assembly comprises a first connector 6 matable with a second connector 4. The first connector 6 in this embodiment comprises a housing 8 and a pair of electrical pin contacts 10 within a cavity 12 of the housing 8 defined by a base wall 14 and a sidewall 16 extending therefrom to a mating face 18. The second connector 4 comprises a housing 20 and complementary electrical receptacle contacts (not shown) mounted therein for mating with the pin contacts 10, the housing 20 having a mating portion 22 received within the cavity 12. In this embodiment, the first connector 6 is part of a gas generator for an automotive airbag.

Surrounding the second connector mating portion 22 in the cavity 12 is a locking device 24. In this embodiment, the locking device 24 is a separate member in the form of a generally cylindrical collar comprising a peripheral wall 26 and locking lances 28. The locking lances 28 project obliquely through a window 30 in the peripheral wall 26 from a first outer locking shoulder 32 to a second inner locking shoulder 34, the outer and inner locking shoulders positioned outside and inside of the peripheral wall 26 respectively. Each locking lance 28 is attached at an approximately centrally positioned attachment portion 36 between ends 32, 34 to the peripheral wall 26. The peripheral wall 26 is substantially prismatic and extends from a mating end 25 to a base end 23 directed towards the base wall 14 of the first connector 6. The lance 28 is resiliently pivotable about a pivot axis 38 positioned proximate the attachment portion 36 as best seen in figures 4 and 5.

Referring to figure 4, the locking lance 28 is shown in a locked position whereby the outer end 32 engages a locking shoulder 40 formed in a recess 42 of the first connector sidewall 16 thereby securing the collar within the first connector cavity 12. The first connector locking shoulder 40 is angled, as is the lance outer end 32, substantially orthogonally to the lance 28 when it is in the locked position as shown in figure 4. The inner end 34 of the lance 28 engages a locking shoulder 44 of the second connector formed on a locking protrusion 21 proximate the mating end of the second connector. The locking shoulder 44 likewise has an angle substantially orthogonal to the lance in its locked position.

A curved abutment or lance release surface 46 is provided at a lower corner of the recess 42 joining the sidewall 16 of the first connector. Upon depression of the locking device toward the first connector base wall 14, abutment of the lance 28 with the release shoulder 46 causes

resilient pivoting of the lance about its pivot axis 38 as shown in figure 5. Pivoting of the lance inner end 34 disengages it from the second connector locking shoulder 44 as shown in figure 5, such that the connectors can be
5 uncoupled. Depression of the locking device can be effected by a tool provided with extensions that are inserted through corresponding holes (not shown) in the second connector housing 20. The connectors 4,6 can thus not be accidentally uncoupled, particularly as the collar is positioned within
10 the cavity 12 and difficult to access. Depression of the collar during uncoupling requires purposive action.

Once the connectors are uncoupled, the resiliency of the lance causes the locking device to resume the unstressed position as shown in figure 4. Coupling is simply effected by
15 plugging the second connector into the first connector cavity 12 whereby the lance resiliently pivots to allow passage of the locking shoulder 44 therepast. The locking device can comprise a plurality of locking lances, for example two or more positioned around the periphery. The locking device
20 could be integrally moulded from a resilient plastic material for a particularly cost-effective design. A very robust retention is provided by the lance self-tightening locking effect which is best understood when referring to figure 4. If an attempt is made to pull the second connector out of the
25 cavity 12, the lance 28 will tend to pivot outwardly (i.e. the outer end 32 pivots further outwardly) thereby providing a self-tightening or increased blocking effect. The locking lance 28 acts in compression. Moulding of the lance enables it to be produced sufficiently thick for operation in
30 compression with high resistance to buckling. A particularly robust, compact and cost-effective locking device is thus provided.

CLAIMS

1. A connector locking device for securely locking mated first and second connectors where the second connector has a mating portion received within a cavity of the first connector, the locking device comprising a peripheral wall receivable in the cavity between the first connector and the second connector mating portion, and one or more resilient locking lances for engaging the connectors to lock them together, wherein the or each lance has an outer and an inner end positioned respectively towards outer and inner sides of the peripheral wall for engaging locking means of the first and second connectors respectively, the or each lance being resiliently pivotally mounted to the peripheral wall.
2. The locking device of claim 1, wherein the or each lance is resiliently pivotally mounted to the peripheral wall at an attachment portion positioned between the inner and outer ends of said lance.
3. The locking device of claim 1 or 2, wherein the locking lance is integrally moulded with the peripheral wall.
4. The locking device of claim 1, 2 or 3, wherein the peripheral wall has a substantially prismatic shape extending in the connector mating direction, whereby the or each lance is oblique to the mating direction.
5. The locking device of any one of the preceding claims, wherein the peripheral wall forms a substantially closed loop surrounding the second connector when positioned in the connector assembly.
6. The locking device of any one of the preceding claims, wherein the or each lance projects through windows in the peripheral wall.
7. The locking device of any one of the preceding claims, wherein the pivot axis of the or each lance is roughly centrally positioned between the lance inner and outer ends.

8. A connector locking device constructed substantially as hereinbefore described with reference to the accompanying drawings.

5 9. A connector assembly comprising a first connector and a second connector lockable together by a locking device according to any one of claims 1 to 8.

10 10. A connector assembly according to claim 9, wherein the first connector comprises a cavity, the locking device being receivable within the cavity and the cavity having locking means for engaging the or each lance outer end, and the second connector comprises locking means for engaging the or each lance inner end.

11. The connector assembly according to claim 10, wherein the locking means comprise locking shoulders.

15 12. The connector assembly according to claim 11, wherein the first and/or second connector locking shoulders is/are angled substantially orthogonally to the or each lance in a direction extending between said inner and outer ends.

20 13. The connector assembly of claim 11 or 12, wherein the first connector shoulder is provided in a recess in the sidewall of the cavity, a corner of the recess with the sidewall being provided with a rounded abutment surface for engaging the or each lance when the locking device is depressed further into the cavity for pivoting thereof to
25 uncouple the connectors.

14. A connector assembly constructed substantially as hereinbefore described with reference to the accompanying drawings.



The Patent Office

7

Application No: GB 9722853.0
Claims searched: 1 - 14

Examiner: Paul Nicholls
Date of search: 24 February 1998

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.P): H2E (ECCC)

Int CI (Ed.6): H01R 13/627

Other:

Documents considered to be relevant:

| Category | Identity of document and relevant passage | Relevant to claims |
|----------|---|--------------------|
| A | GB 2,177,266 A (AMP) - Whole document | - |
| A | GB 2,061,633 A (NISSAN) - Whole document | - |

| | | | |
|---|---|---|--|
| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. | P | Document published on or after the declared priority date but before the filing date of this invention. |
| & | Member of the same patent family | E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |